Gasification boiler for solid fuels, in particular for bales of straw, with optimized exhaust gas values

Description

The invention relates to a gasification boiler for the combustion of solid fuels, especially bales of straw, for heating purposes and for the production of hot water. The invention is distinguished by optimum combustion and ash separation. The prescribed exhaust gas values are therefore reliably kept to.

Prior art

The principle of fuel gasification in a furnace space and of aftercombustion in a separate combustion space has substantial advantages for fuels in lump form. These are primarily a substantial, clean combustion, and therefore low environmental pollution and a high energy yield. The known designs comprise a closed fuel-filling space with filling door, a lower burn-up and gasification zone, a lower grating and combustion nozzle with a combustion space, air feeds, heat exchanger and ash separator situated under or behind it. A heating boiler of this type for combustion of solid material is described, for example, in DE-A 34 08 602 and DE-C 37 18 022. To improve the combustion, special air and combustion gas guides have been proposed. According to DE-A 3411822, the filling shaft is in the form of a double cone with gas outlet openings and an annular combustion duct in the extension. A uniform burn-up and simple construction are intended to be realized therewith. DE-C 3617146 illustrates a special air feed for the primary air in order to achieve a good combustion gas/air mixture. The fan is mounted on the filling door and feeds external air into three levels of the fuel shaft. The solution in DE-C 3718022 contains two air feed levels in the

fuel shaft and one to the combustion space. With the recycling of exhaust gas, particularly good gasification is intended to be achieved.

The fuel comprising bales of straw causes particular requirements. There is the problem of uniform gasification which is obstructed by carbonization of the outer layers. A high content of uncombusted small constituents and a low ash melting point have an unfavorable effect on the exhaust gas values and dirty the heat exchange surfaces (DE-A 41 34 754).

Object of the invention

It is the object of the invention to carry out the combustion even of small particles as completely as possible and to virtually completely separate the ash from the combustion gas upstream of the heat exchangers.

This object is achieved by the features of claim 1.

According to feature 1, the fuel and gasification space has depressions laterally next to the centrally arranged grating and the combustion space. Coarse particles accumulate in said depressions while just the fine particles are still carried along by the combustion gas into the combustion space. The coarse particles can outgas in the depressions and do not load the combustion gas flow. After the combustion has ended, the remaining ash can be removed there.

According to feature 2, a cylindrical combustion chamber designed as an additional constructional unit is connected to the outlet of the combustion space. This aftercombustion chamber considerably extends the combustion time, as a result of which small particles contained and partially oxidized gases completely

combust. The tangential introduction of the combustion gas acts as a cyclone, so that further ash accumulates at the bottom. This can be removed through a cover.

According to feature 3, a cylindrical ash separator which is designed as an additional constructional unit is connected to the combustion chamber. In this ash separator, the remaining ash constituents are removed from the flue gas. The heat exchanger arranged downstream is therefore no longer loaded with ash.

The interaction of the three structural features therefore brings about a more complete combustion, improved ash separation and therefore lower loading of the exhaust gas. In addition, however, the maintenance and service life of the heat exchanger are also improved.

Special refinements of the invention are explained in the subclaims.

Examples

The invention is explained below by way of an example.

Figure 1 shows a gasification boiler in front view in section,

Figure 2 shows the side view of the entire heating installation in section, and

Figure 3 shows a plan view of the entire heating installation.

A fuel and gasification space 1 and, below it, a horizontal, cylindrical combustion space 3 are arranged in a housing. A filling door for the bales of straw and two doors for the removal of ash are fixed on the front side. At the lower apex of the fuel and gasification space 1, there is a longitudinal slot in the bottom extending over the entire depth. A grating 2 is embedded in said longitudinal slot. Situated below the grating 2 are gas nozzles which lead into a combustion

space 6. The latter comprises pipe sections of refractory concrete which are guided in a steel pipe.

The fuel and gasification space 1 has depressions 4 parallel to the grating 2 and combustion space 3. Said depressions are of half-shell-shaped design. The wall has a respective door in the end region for the removal of ash.

The heating boiler with fuel and gasification space 1 and combustion space 3 is designed as a constructional unit.

The combustion chamber 5, ash separator 6 and heat exchanger which are arranged downstream are brought together by means of a framework 10 to form a further constructional unit.

Combustion chamber 5 and ash separator 6 have a cylindrical housing standing perpendicularly. The walls of the housings are insulated and the latter are closed at the top by a shell-shaped cover.

In the ash separator, a pipe is fitted centrally in the upper region and below it a circular baffle plate (8) is fitted in such a manner that an annular opening for the depositing of ash remains from the outer wall.

The adjoining heat exchangers are arranged in a vertical flue gas vent.

A circulating air fan causes the combustion gases to have a rotational movement in the fuel and gasification space 1. The loose, heavy particles of the combustion matter accumulate in the outer, lateral depressions 4 where they completely combust. Lightweight airborne particles are carried along by the combustion gas flow and at the latest are completely combusted in the combustion chamber 5. Repeated separation of the ash takes place in the ash separator 6. When gas is admitted, the ash particles are pressed against the inner wall and, when deflected by the baffle plate 8, drop downward. The removal of ash takes place through the upper covers 7, 9 and a door in the bottom region

of the ash separator 6. The gas flow cleaned in this manner is conducted across the heat exchangers.

List of reference numbers

1	Fuel and gasification space
2	Grating
3	Combustion space
4	Lateral depression
5	Combustion chamber
6	Ash separator
7	Cover combustion chamber
8	Baffle plate
9	Cover ash separator
10	Framework